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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/076,443	02/19/2002	Atsuhiro Ohkawa	030662-082	9882

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EXAMINER	
HON, SOW FUN	

ART UNIT	PAPER NUMBER
1772	

DATE MAILED: 04/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/076,443	Applicant(s) OHKAWA ET AL.
	Examiner Sow-Fun Hon	Art Unit 1772

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 October 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,6 and 8-45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,6,8-24 and 26-45* is/are rejected.

7)☒ Claim(s) *25* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/24/05 has been entered.

Response to Amendment

Withdrawn Rejections

2. The 35 U.S.C. 103(a) rejection has been withdrawn due to Applicant's amendment dated 10/24/05.

New Rejections

Claim Rejections - 35 USC § 103

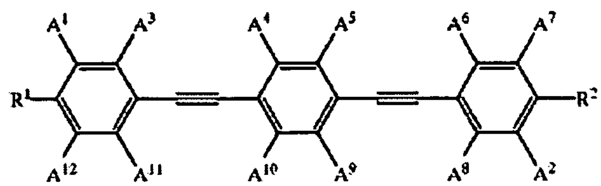
The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 6, 9-13, 15-21, 24, 26-29, 31-35, 37-40, 43, 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson (US 5,751,388) in view of Sekine (US 6,149,837).

Regarding claims 1, 6, Larson teaches an optical polarized light scattering (PSSE) film comprises a support(ing substrate, column 6, lines 40-50) and a PDLC layer (column 6, lines 50-55) that is linearly polarizing (column 10, lines 40-50). Larson teaches that the PSSE film transmits approximately 90 % via the pass axis and 30 % via the rejection axis, of the polarized light (column 7, lines 1-10), which means that the support is transparent, and that the linearly polarizing layer selectively transmits polarized light and reflects or scatters other polarized light. The linearly polarizing layer (PDLC film) contains a liquid crystal compound (LC) with fixed alignment (maintain alignment geometry, column 6, lines 45-55). Larson fails to teach the claimed formula (I) of the liquid crystal compound.

However, Sekine teaches an optical film comprising a PDLC (polymer dispersed liquid crystal element layer, column 1, lines 1-20), used in a liquid crystal display (column 3, lines 1-5). Sekine teaches compound (1) shown on the next page, wherein R^1 and R^2 each independently represent a hydrogen atom (rendering the end aromatic ring a monovalent one), which yields an embodiment which is the same as Applicant's formula (I), wherein: Ar^1 = Ar^2 = monovalent aromatic hydrocarbon group, and Ar^3 = divalent aromatic hydrocarbon group. Sekine teaches that R^1 and R^2 each independently can also be a cyano group (column 3, lines 10-35), in which case, each of Ar^1 and Ar^2 can independently be a monovalent cyano-substituted aromatic hydrocarbon (column 3, lines 10-35).

(1)



In the formula, A^1 to A^{12} each independently represent a hydrogen atom, a fluorine atom, or an alkyl group having 1 to 10 carbon atoms, and at least one is an alkyl group (provided that, in A^1 to A^{12}, the cases are excluded where both of A^1 and A^2 are methyl groups at the same time, while the others are hydrogen atoms, and where both of A^7 and A^{12} are methyl groups at the same time, while the others are hydrogen atoms); R^1 and R^2 each independently represent a hydrogen atom, a fluorine atom, a cyano group, a 4-R^3-(cycloalykyl) group, a 4-R^3-(cycloalkenyl) group, or a R^4—$(O)_q$ group (where R^3 represents a hydrogen atom, a linear or branched alkyl group having 1 to 12 carbon atoms which may be substituted by fluorine, a linear or branched alkenyl group having 2 to 12 carbon atoms which may be substituted by fluorine, or a linear or branched alkynyl group having 2 to 12 carbon atoms which may be substituted by a fluorine

Sekine teaches that the liquid crystal compound of formula (1) has a large anisotropy of refractive index (column 2, lines 65-70). Hence the layer is highly polarizing due to its large refractive index anisotropy. In addition, Sekine teaches that the compound is more advantageous in stability to light (column 3, lines 1-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the liquid crystal compound of Sekine as the liquid crystal in the PDLC layer of Larson, in order to obtain a linearly polarizing layer with the desired high polarization, in addition to light stability, as taught by Sekine.

Regarding claims 9-10, Larson teaches that the polymer matrix phase is optionally birefringent (may also be, column 6, lines 35-40), which means that it can be

optically isotropic (non-birefringent), while the liquid crystal (LC) phase is optically anisotropic (high birefringence, column 6, lines 45-50).

Regarding claim 11, Larson teaches that the PSSE layer transmits approximately 90 % via the pass axis and 30 % via the rejection axis, which respectively overlap the claimed range of maximum transmittance of all rays of more than 75% and the claimed range of minimum transmittance for all rays of less than 60% (column 7, lines 1-20).

Regarding claim 12, Larson teaches that the difference between the refractive index of the optically isotropic phase (polymer matrix) and the refractive index of the optically anisotropic phase (LC) is less than 0.05 (matches) along a direction (ordinary or extraordinary) in a surface plane of the polymer dispersed liquid crystal film (PDLC structure, column 6, lines 30-40).

Regarding claim 13, Sekine teaches that R^1 and R^2 can independently represent a linear or branched alkenyl group (column 4, lines 25-30), which is a polymerizable group.

Regarding claim 15, Larson teaches that the linearly polarizing PDLC layer comprises droplets (column 6, lines 20-25) or particles of optically anisotropic (birefringent liquid) crystals (column 5, lines 60-70) which is a discontinuous phase, embedded in a polymer matrix which is the continuous phase, and is optically isotropic (non-birefringent, column 8, lines 45-50).

Regarding claim 16, Larson fails to teach that the linearly polarizing layer is formed by stretching the film, by ten times or less.

However, Larson teaches that the film is uniaxially stretched to elongate the droplets of liquid crystal (column 6, lines 30-40), wherein the amount of scattering in the vertical axis is determined by controlling the length scale of the droplets (column 13, lines 45-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have optimized the process of forming the linearly polarized film of Larson, wherein the film is stretched by ten times or less, in order to provide the desired amount of scattering in the vertical axis of the liquid crystal droplets, as taught by Larson.

Regarding claim 17, Larson teaches an absorbing rear polarizer 198 and a polarizing element of light scattering kind (PSSE layer 193, column 13, lines 55-65) in Fig 10 shown on the next page, with an axis having the polarizing plane which gives the maximum transmittance for all rays, parallel to the transparent axis of the polarizing element of light absorbing kind (output polarization rays of 193 match the pass-axis of the rear polarizer 198, column 14, lines 1-10). The polarizing plane of the light scattering-polarizing element 193, has a polarization plane perpendicular to the surface plane of said element 193, since the transmitted rays are perpendicular to the surface plane of the element.

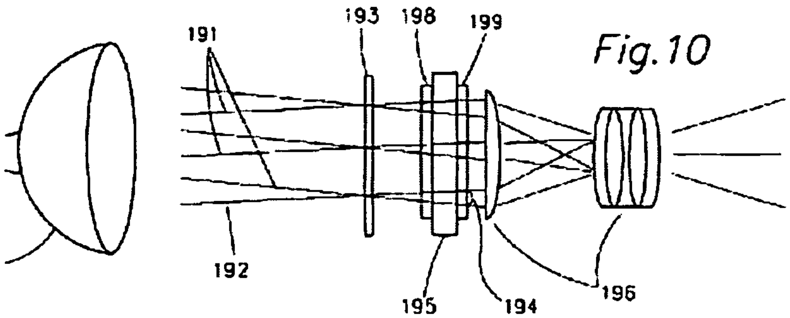


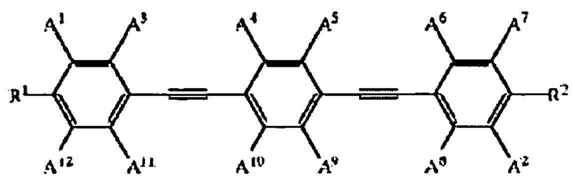
Fig.10

Larson teaches that the optical polarized light scattering (PSSE) film comprises a support(ing substrate, column 6, lines 40-50) and a PDLC layer (column 6, lines 50-55) that is linearly polarizing (column 10, lines 40-50). Larson teaches that the PSSE film transmits approximately 90 % via the pass axis and 30 % via the rejection axis, of the polarized light (column 7, lines 1-10), which means that the support is transparent, and that the linearly polarizing layer selectively transmits polarized light, and reflects or scatters other polarized light. The linearly polarizing layer (PDLC film) contains a liquid crystal compound (LC) with fixed alignment (maintain alignment geometry, column 6, lines 45-55). Larson fails to teach the claimed formula (I) of the liquid crystal compound.

However, Sekine teaches an optical film comprising a PDLC (polymer dispersed liquid crystal element layer, column 1, lines 1-20), used in a liquid crystal display (column 3, lines 1-5). Sekine teaches compound (1) shown on the next page, wherein R^1 and R^2 each independently represent a hydrogen atom (rendering the end aromatic ring a monovalent one), which yields an embodiment which is the same as Applicant's formula (I), wherein: $Ar^1 = Ar^2$ = monovalent aromatic hydrocarbon group, and Ar^3 = divalent aromatic hydrocarbon group. Sekine teaches that R^1 and R^2 each

independently can also be a cyano group (column 3, lines 10-35), in which case, each of Ar^1 and Ar^2 can independently be a monovalent cyano-substituted aromatic hydrocarbon (column 3, lines 10-35).

(1)



Sekine teaches that the liquid crystal compound of formula (1) has a large anisotropy of refractive index (column 2, lines 65-70). Hence the layer is highly polarizing due to its large refractive index anisotropy. In addition, Sekine teaches that the compound is more advantageous in stability to light (column 3, lines 1-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the liquid crystal compound of Sekine as the liquid crystal in the PDLC layer of Larson, in order to obtain a linearly polarizing layer with the desired high polarization, in addition to light stability, as taught by Sekine.

Regarding claim 19, Larson teaches a liquid crystal display (LCD, column 4, lines 30-35) which comprises a backlight (13), a polarizing plate (16), a liquid crystal cell (10) and another polarizing plate (15, column 4, lines 30-35)), in this order, as shown in Fig. 1 of Larson on the next page, wherein the polarizing plate combination placed between the backlight (13) and the liquid crystal cell (10), comprises a polarizing element of light scattering type (PSSE 17) and a polarizing element (16) of light-absorbing type (rear absorbing polarizer, column 7, lines 15-20), said polarizing element of light-scattering type selectively transmitting polarized light and selectively absorbing other polarized

light (transmits approximately 90 % via the pass axis and 30 % via the rejection axis, of the polarized light, column 7, lines 1-10), wherein the polarizing element of light-scattering type has a linearly polarizing layer (column 10, lines 40-50) comprising an

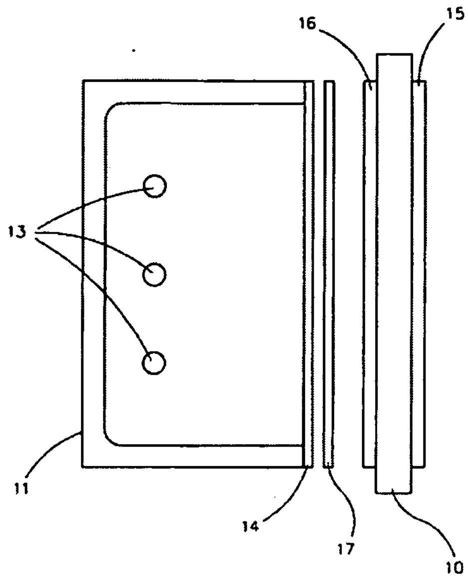
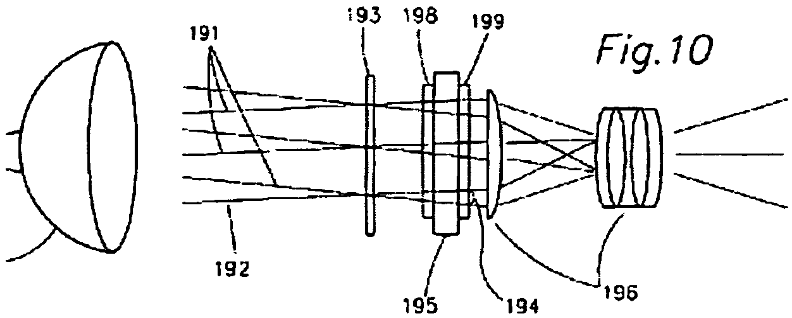


Fig. 1

optically isotropic phase and an optically anisotropic phase (non-birefringent matrix and birefringent crystals, column 8, lines 45-50), wherein the polarizing element of light scattering type 193 has a polarizing plane perpendicular to a surface plane of the polarizing element since the transmitted rays are perpendicular to the surface plane of the element (output polarization rays of 193 match the pass-axis of the rear polarizer 198, column 14, lines 1-10), as shown in Fig. 10 of Larson, on the next page.

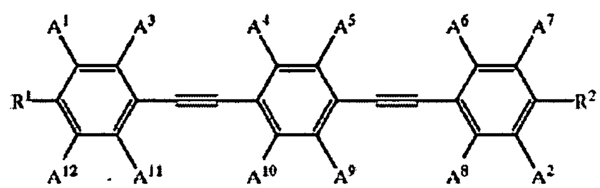


Larson teaches that the PSSE layer transmits approximately 90 % via the transmittance (pass) axis and 30 % via the non-transmittance (rejection) axis, which respectively overlap the claimed range of maximum transmittance of all rays of more than 75% and the claimed range of minimum transmittance for all rays of less than 60% (column 7, lines 1-20), wherein an axis having the polarizing plane giving the maximum transmittance for all rays is essentially parallel to the transmittance axis of the polarizing element of light-absorbing type (output polarization rays of 193 match the pass-axis of the rear polarizer 198, column 14, lines 1-10, rear absorbing polarizer, column 7, lines 15-20). The optically anisotropic phase of the linearly polarizing layer (PDLC film) contains a liquid crystal compound (LC) with fixed alignment (maintain alignment geometry, column 6, lines 45-55). Larson fails to teach the claimed formula (I) of the liquid crystal compound.

However, Sekine teaches an optical film comprising a PDLC (polymer dispersed liquid crystal element layer, column 1, lines 1-20), used in a liquid crystal display (column 3, lines 1-5). Sekine teaches compound (1) shown on the next page, wherein R^1 and R^2 each independently represent a hydrogen atom (rendering the end aromatic ring a monovalent one), which yields an embodiment which is the same as Applicant's

formula (I), wherein: $Ar^1 = Ar^2$ = monovalent aromatic hydrocarbon group, and Ar^3 = divalent aromatic hydrocarbon group. Sekine teaches that R^1 and R^2 each independently can also be a cyano group (column 3, lines 10-35), in which case, each of Ar^1 and Ar^2 can independently be a monovalent cyano-substituted aromatic hydrocarbon (column 3, lines 10-35).

(1)



In the formula, A^1 to A^{12} each independently represent a hydrogen atom, a fluorine atom, or an alkyl group having 1 to 10 carbon atoms, and at least one is an alkyl group (provided that, in A^1 to A^{12}, the cases are excluded where both of A^1 and A^2 are methyl groups at the same time, while the others are hydrogen atoms, and where both of A^7 and A^{12} are methyl groups at the same time, while the others are hydrogen atoms); R^1 and R^2 each independently represent a hydrogen atom, a fluorine atom, a cyano group, a 4-R^3-(cycloalykyl) group, a 4-R^3-(cycloalkenyl) group, or a R^4—$(O)_q$ group (where R^3 represents a hydrogen atom, a linear or branched alkyl group having 1 to 12 carbon atoms which may be substituted by fluorine, a linear or branched alkenyl group having 2 to 12 carbon atoms which may be substituted by fluorine, or a linear or branched alkynyl group having 2 to 12 carbon atoms which may be substituted by a fluorine

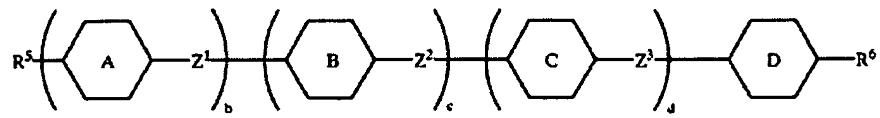
Sekine teaches that the liquid crystal compound of formula (1) has a large anisotropy of refractive index (column 2, lines 65-70). Hence the layer is highly polarizing due to its large refractive index anisotropy. In addition, Sekine teaches that the compound is more advantageous in stability to light (column 3, lines 1-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used the liquid crystal compound of Sekine as the liquid crystal in the PDLC layer of Larson, in order to obtain a linearly polarizing layer with the desired high polarization, in addition to light stability, as taught by Sekine.

Regarding claims 20-21, Larson teaches that the alignment is fixed (induced alignment locked in by the application of localized UV light, column 7, lines 65-70 and column 8, lines 1-5) by polymerization of the liquid crystal compound (LC), conducted by exposing the film to ultraviolet light (UV-cure, column 8, lines 60-70).

Regarding claims 24, 26-29, 32, Larson teaches an optical polarized light scattering (PSSE) film comprises a support(ing substrate, column 6, lines 40-50) and a PDLC layer (column 6, lines 50-55) that is linearly polarizing (column 10, lines 40-50). Larson teaches that the PSSE film transmits approximately 90 % via the pass axis and 30 % via the rejection axis, of the polarized light (column 7, lines 1-10), which means that the support is transparent, and that the linearly polarizing layer selectively transmits polarized light, and reflects or scatters other polarized light. The linearly polarizing layer (PDLC film) contains a liquid crystal compound (LC) with fixed alignment (maintain alignment geometry, column 6, lines 45-55). Larson fails to teach the claimed formula (I) of the liquid crystal compound.

However, Sekine teaches an optical film comprising a PDLC (polymer dispersed liquid crystal element layer, column 1, lines 1-20), used in a liquid crystal display (column 3, lines 1-5). Sekine teaches the liquid crystal compound (formula 3) shown on the next page.



(3)

Wherein b = 1, c = 1, d = 0 (no C ring or Z^3 linking group), where A, B and D each independently represent 1, 4- phenylene (six-membered aromatic hydrocarbon group), 2,5-pyrimidinediyl, 5,2-pyrimidinediyl, 2,5-dioxanediyl or 5,2-dioxanediyl (six-membered aromatic heterocyclic groups), and R^5 and R^6 independently represent a hydrogen atom, rendering aromatic ring A or D (Ar^1 and Ar^2 of Applicant) a monovalent one, or a cyano group (column 4, lines 55-60), rendering aromatic ring A or D (Ar^1 and Ar^2 of Applicant) a monovalent cyano-substituted one. Z^1 and Z^2 each independently represent an alkynylene group having 2 carbons (triple bond acetylene, column 5, lines 1-10). Sekine teaches that A, B and D can also independently represent 2,5-pyrimidinediyl, 5,2-pyrimidinediyl, 2,5-dioxanediyl or 5,2-dioxanediyl (six-membered aromatic heterocyclic groups), which means that at least one of Ar^1, Ar^2 and Ar^3 can independently be an aromatic heterocyclic group, wherein Ar^1 and Ar^2 would be monovalent aromatic six-membered heterocyclic groups, and Ar^3 would be a divalent aromatic six-membered heterocyclic group.

Regarding claims 31, 37, Larson teaches that the linearly polarizing PDLC layer comprises droplets (column 6, lines 20-25) or particles of optically anisotropic (birefringent liquid) crystals (column 5, lines 60-70) which is a discontinuous phase, embedded in a polymer matrix which is the continuous phase, and is optically isotropic (non-birefringent, column 8, lines 45-50).

Regarding claim 33, Larson teaches that the PSSE layer transmits approximately 90 % via the transmittance (pass) axis and 30 % via the non-transmittance (rejection) axis, which respectively overlap the claimed range of maximum transmittance of all rays of more than 75% and the claimed range of minimum transmittance for all rays of less than 60% (column 7, lines 1-20).

Regarding claim 34, Larson teaches that the difference between the refractive index of the optically isotropic phase (polymer matrix) and the refractive index of the optically anisotropic phase (LC) is less than 0.05 (matches) along a direction (ordinary or extraordinary) in a surface plane of the polymer dispersed liquid crystal film (PDLC structure, column 6, lines 30-40).

Regarding claim 35, Sekine teaches that R^1 and R^2 can independently represent a linear or branched alkenyl group (column 4, lines 25-30), which is a polymerizable group.

Regarding claim 38, Larson fails to teach that the linearly polarizing layer is formed by stretching the film, by ten times or less.

However, Larson teaches that the film is uniaxially stretched to elongate the droplets of liquid crystal (column 6, lines 30-40), wherein the amount of scattering in the vertical axis is determined by controlling the length scale of the droplets (column 13, lines 45-50).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have optimized the process of forming the linearly polarized film of Larson, wherein the film is stretched by ten times or less, in order to

provide the desired amount of scattering in the vertical axis of the liquid crystal droplets, as taught by Larson.

Regarding claims 39-40, Larson teaches that the alignment is fixed (induced alignment locked in by the application of localized UV light, column 7, lines 65-70 and column 8, lines 1-5) by polymerization of the liquid crystal compound (LC), conducted by exposing the film to ultraviolet light (UV-cure, column 8, lines 60-70).

Regarding claim 43, Larson teaches an absorbing rear polarizer 198 and a polarizing element of light scattering kind (PSSE layer 193, column 13, lines 55-65) in Fig 10 shown below, with an axis having the polarizing plane which gives the maximum transmittance for all rays, parallel to the transparent axis of the polarizing element of light absorbing kind (output polarization rays of 193 match the pass-axis of the rear polarizer 198, column 14, lines 1-10). The polarizing plane of the light scattering-polarizing element 193, has a polarization plane perpendicular to the surface plane of said element 193, since the transmitted rays are perpendicular to the surface plane of the element.

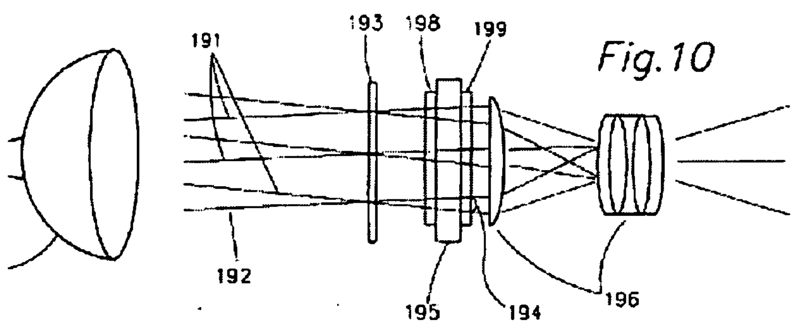
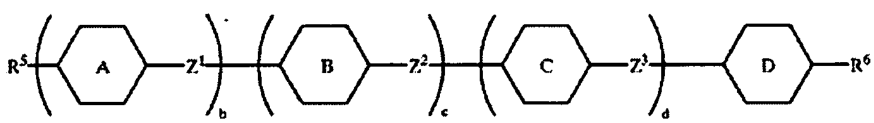


Fig.10

Larson teaches that the optical polarized light scattering (PSSE) film comprises a support(ing substrate, column 6, lines 40-50) and a PDLC layer (column 6, lines 50-55)

that is linearly polarizing (column 10, lines 40-50). Larson teaches that the PSSE film transmits approximately 90 % via the pass axis and 30 % via the rejection axis, of the polarized light (column 7, lines 1-10), which means that the support is transparent, and that the linearly polarizing layer selectively transmits polarized light, and reflects or scatters other polarized light. The linearly polarizing layer (PDLC film) contains a liquid crystal compound (LC) with fixed alignment (maintain alignment geometry, column 6, lines 45-55). Larson fails to teach the claimed formula (I) of the liquid crystal compound.

However, Sekine teaches an optical film comprising a PDLC (polymer dispersed liquid crystal element layer, column 1, lines 1-20), used in a liquid crystal display (column 3, lines 1-5). Sekine teaches the liquid crystal compound (formula 3) below,



(3)

wherein b = 1, c = 1, d = 0 (no C ring or Z^3 linking group), where A, B and D each independently represent 1, 4- phenylene (six-membered aromatic hydrocarbon group), 2,5-pyrimidinediyl, 5,2-pyrimidinediyl, 2,5-dioxanediyl or 5,2-dioxanediyl (six-membered aromatic heterocyclic groups), and R^5 and R^6 independently represent a hydrogen atom, rendering aromatic ring A or D (Ar^1 and Ar^2 of Applicant) a monovalent one, or a cyano group (column 4, lines 55-60), rendering aromatic ring A or D (Ar^1 and Ar^2 of Applicant) a monovalent cyano-substituted one. Z^1 and Z^2 each independently represent an alkynylene group having 2 carbons (triple bond acetylene, column 5, lines 1-10). Sekine teaches that A, B and D can also independently represent 2,5-

pyrimidinediyl, 5,2-pyrimidinediyl, 2,5-dioxanediyl or 5,2-dioxanediyl (six-membered aromatic heterocyclic groups), which means that at least one of Ar^1, Ar^2 and Ar^3 can independently be an aromatic heterocyclic group, wherein Ar^1 and Ar^2 would be monovalent aromatic six-membered heterocyclic groups, and Ar^3 would be a divalent aromatic six-membered heterocyclic group.

Regarding claim 45, Larson teaches a liquid crystal display (LCD, column 4, lines 30-35) which comprises a backlight (13), a polarizing plate (16), a liquid crystal cell (10) and another polarizing plate (15, column 4, lines 30-35)), in this order, as shown in Fig. 1 of Larson below, wherein the polarizing plate combination placed between the backlight (13) and the liquid crystal cell (10), comprises a polarizing element of light scattering type (PSSE 17) and a polarizing element (16) of light-absorbing type (rear absorbing polarizer, column 7, lines 15-20), said polarizing element of light-scattering

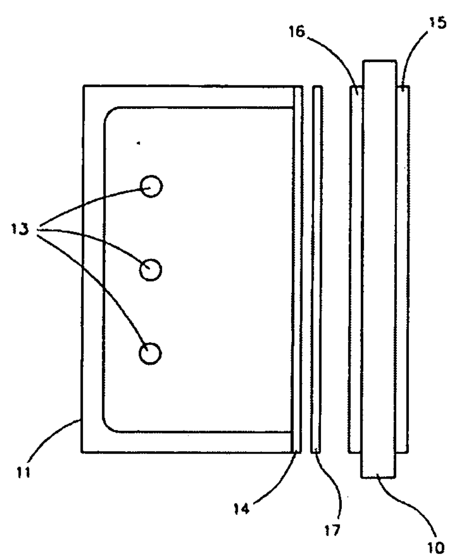


Fig. 1

type selectively transmitting polarized light and selectively absorbing other polarized light (transmits approximately 90 % via the pass axis and 30 % via the rejection axis, of the polarized light, column 7, lines 1-10), wherein the polarizing element of light-scattering type has a linearly polarizing layer (column 10, lines 40-50) comprising an optically isotropic phase and an optically anisotropic phase (non-birefringent matrix and birefringent crystals, column 8, lines 45-50), wherein the polarizing element of light scattering type 193 has a polarizing plane perpendicular to a surface plane of the polarizing element since the transmitted rays are perpendicular to the surface plane of the element (output polarization rays of 193 match the pass-axis of the rear polarizer 198, column 14, lines 1-10), as shown in Fig. 10 of Larson, below.

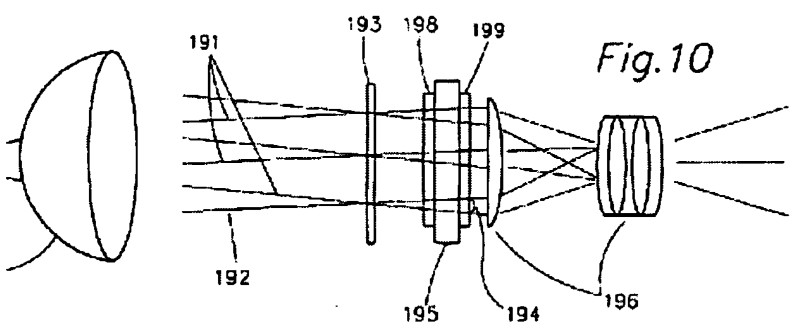
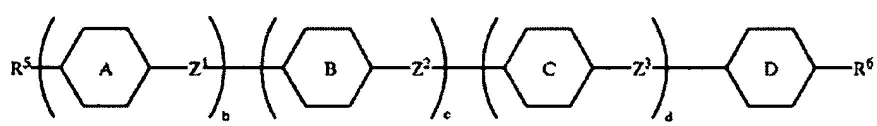


Fig. 10

Larson teaches that the PSSE layer transmits approximately 90 % via the transmittance (pass) axis and 30 % via the non-transmittance (rejection) axis, which respectively overlap the claimed range of maximum transmittance of all rays of more than 75% and the claimed range of minimum transmittance for all rays of less than 60% (column 7, lines 1-20), wherein an axis having the polarizing plane giving the maximum

transmittance for all rays is essentially parallel to the transmittance axis of the polarizing element of light-absorbing type (output polarization rays of 193 match the pass-axis of the rear polarizer 198, column 14, lines 1-10, rear absorbing polarizer, column 7, lines 15-20). The optically anisotropic phase of the linearly polarizing layer (PDLC film) contains a liquid crystal compound (LC) with fixed alignment (maintain alignment geometry, column 6, lines 45-55). Larson fails to teach the claimed formula (I) of the liquid crystal compound.

However, Sekine teaches an optical film comprising a PDLC (polymer dispersed liquid crystal element layer, column 1, lines 1-20), used in a liquid crystal display (column 3, lines 1-5). Sekine teaches the liquid crystal compound (formula 3) below,



(3)

wherein b = 1, c = 1, d = 0 (no C ring or Z^3 linking group), where A, B and D each independently represent 1, 4- phenylene (six-membered aromatic hydrocarbon group), 2,5-pyrimidinediyl, 5,2-pyrimidinediyl, 2,5-dioxanediyl or 5,2-dioxanediyl (six-membered aromatic heterocyclic groups), and R^5 and R^6 independently represent a hydrogen atom, rendering aromatic ring A or D (Ar^1 and Ar^2 of Applicant) a monovalent one, or a cyano group (column 4, lines 55-60), rendering aromatic ring A or D (Ar^1 and Ar^2 of Applicant) a monovalent cyano-substituted one. Z^1 and Z^2 each independently represent an alkynylene group having 2 carbons (triple bond acetylene, column 5, lines 1-10). Sekine teaches that A, B and D can also independently represent 2,5-pyrimidinediyl, 5,2-pyrimidinediyl, 2,5-dioxanediyl or 5,2-dioxanediyl (six-membered

aromatic heterocyclic groups), which means that at least one of Ar^1, Ar^2 and Ar^3 can independently be an aromatic heterocyclic group, wherein Ar^1 and Ar^2 would be monovalent aromatic six-membered heterocyclic groups, and Ar^3 would be a divalent aromatic six-membered heterocyclic group.

4. Claims 8, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson in view of Sekine as applied to claims 1, 6, 9-13, 15-21, 24, 26-29, 31-35, 37-40, 43, 45 above, and further in view of Nippon (Abstract, JP 56057850).

Larson in view of Sekine has been discussed above, and fails to teach that at least one of Ar^1, Ar^2 and Ar^3 has a substituent group containing hydroxyl.

However, Sekine teaches that the hydrogen atom on the aromatic ring is substituted by a halogen atom for the purpose of improving compatibility with the other materials (liquid crystals) in the polarizing layer (column 2, lines 35-65). Sekine fails to teach that the hydrogen atom on the aromatic ring is substituted by a substituent group containing hydroxyl.

However, Nippon teaches that a hydrogen on a side position of any one benzene ring is substituted by a hydroxyl group or a halogen group (fluorine, chlorine, abstract), wherein the compound has excellent compatibility with liquid crystals (abstract).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have provided at least one of Ar^1, Ar^2 and Ar^3 with a substituent group containing hydroxyl, in the liquid crystal compound of Larson in view of Sekine, in order to provide the desired compatibility, as taught by Sekine in view of Nippon.

5. Claims 14, 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson in view of Sekine as applied to claims 1, 6, 9-13, 15-21, 24, 26-29, 31-35, 37-40, 43, 45 above, and further in view of West (US 4,685,771).

Larson in view of Sekine has been discussed above, and fails to teach that the optically anisotropic discontinuous liquid crystal phase has a mean particle size of 0.01 to 1.0 μm.

However, West teaches that the liquid crystal droplet (column 3, lines 67-68) has a mean particle size of 0.2 to 10 μm (microns, column 5, lines 1-2), which overlaps the claimed range of 0.01 to 10 μm, for the purpose of providing efficient scattering (column 4, lines 66-68) by a polymer dispersed liquid crystal element (column 1, lines 14-17).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have provided the optically anisotropic discontinuous liquid crystal phase of Larson in view of Sekine, with a mean particle size within the range of 0.01 to 1.0 μm, in order to provide efficient scattering, as taught by West.

6. Claims 18, 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson in view of Sekine as applied to claims 1, 6, 9-13, 15-21, 24, 26-29, 31-35, 37-40, 43, 45 above, and further in view of Uehara (US 4,772,885).

Larson in view of Sekine has been discussed above. Larson teaches a liquid crystal display (LCD) which comprises a liquid crystal cell (10) and comprises a pair of polarizing plates (15, 16) sandwiching the liquid crystal cell (10), wherein the optical light scattering (pre) polarizing film (17) is provided between a backlight (13) and the polarizing plate on the backlight side of the cell (16) (column 4, lines 30-35). Larson in

view of Sekine fails to disclose that the liquid crystal cell has a liquid crystal compound sealed between a pair of substrates having a transparent electrode and a pixel electrode.

However, Uehara teaches that a common liquid crystal display comprises a liquid crystal cell 11 which has a liquid crystal compound 19 sealed between a pair of substrates (plates 13, 15) having a transparent electrode 23 and a pixel electrode 21 (column 2, lines 48-58), demonstrating that such a structure is well known in the art.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have provided a liquid crystal cell which has a liquid crystal compound sealed between a pair of substrates having a transparent electrode and a pixel electrode, as the liquid crystal cell of Larson in view of Sekine, as is well known in the art, as demonstrated by Uehara.

7. Claims 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Larson in view of Sekine as applied to claims 1, 6, 9-13, 15-21, 24, 26-29, 31-35, 37-40, 43, 45 above, and further in view of Shen (US 5,672,296).

Larson in view of Sekine has been discussed above, and fails to teach that the alignment of the liquid crystal compound in the optical film can be fixed by crosslinking of boric acid.

However, Shen teaches a polarizing layer (film) which comprises aromatic liquid crystalline polymer, whereby boric acid as a crosslinking agent is well known to those skilled in the art at the time the invention was made (column 2, lines 55-60). Shen

teaches that the film is immersed in an aqueous solution of the boric acid (column 5, lines 25-35).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, to have used boric acid solution crosslinking, in lieu of the UV light crosslinking process of Larson in view of Sekine, in order to obtain an alternate optical polarizing film with the desired fixed alignment of liquid crystal domains, as taught by Shen.

Declaration Pursuant to Rule 132

8. The declaration pursuant to Rule 132, filed 12/16/05, is directed to the comparison of the liquid crystal in US 4,685,771 (West) with that of Applicant's invention. However, Applicant has not shown any comparative data regarding the liquid crystal of US 6,149,837 (Sekine), which is the actual secondary reference teaching the liquid crystal in the rejection of the present claims as being obvious over the combination of Larson in view of Sekine.

Allowable Subject Matter

9. Claim 25 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The closest cited prior art of record, US 5,751,388, fails to teach or suggest, even in view of US 6,149,837, US 4,685,771, US 4,772,885, US 5,672,296 or JP 56057850A, the combination of an optical film

comprising a transparent support and a linearly polarizing layer which selectively transmits polarized light and which selectively reflects or scatters other polarized light, wherein the linearly polarizing layer contains a liquid crystal compound represented by the following formula (I), wherein the compound has a fixed alignment:

$$\text{(I)} \qquad Ar^1\text{-}C{\equiv}C\text{-}Ar^3\text{-}C{\equiv}C\text{-}Ar^2$$

in which each of Ar^1 and Ar^2 independently is a monovalent aromatic group, and Ar^3 is a divalent aromatic five-membered heterocyclic group, a divalent condensed aromatic five-membered heterocyclic group or a divalent aromatic group formed by connecting two or three groups thereof. None of the references teach that Ar^3 is a divalent aromatic five-membered heterocyclic group, a divalent condensed aromatic five-membered heterocyclic group or a divalent aromatic group formed by connecting two or three groups thereof.

Response to Arguments

10. Applicant's arguments against the valid combination of Larson in view of Sekine have been fully considered but they are not persuasive.

11. Applicant argues that Larson reference to the polymer liquid crystal structure disclosed by US 4,685,771 obviates the need to employ the liquid crystal compound of Sekine, which has a completely different structure.

Applicant is respectfully apprised that Larson is actually stating that materials having static scattering properties which are polarization-dependent have been known for decades, but have received little attention, and cites Land for describing a

suspension of aligned birefringent crystals embedded in a polymer matrix as being one example (column 5, lines 62-67), then in the next sentence, cites US 5,685,771 for describing a polymer dispersed liquid crystal (PDLC) structure, as another example, and, in the same sentence, states that others have reported related polymer network LC structures with similar polarization sensitive scattering properties (column 6, lines 1-5). Thus, Larson is only disclosing that the materials used to fabricate the polarization sensitive scattering elements have been known for decades. On the other hand, Sekine teaches a novel liquid crystal compound which has a large anisotropy of refractive index, and is very stable to light, for use in a display element (abstract), such as a polymer dispersed liquid crystal (PDLC) type liquid crystal element (column 1, lines 15-20). Therefore, one of ordinary skill in the art would have been motivated to use the novel liquid crystal compound of Sekine in place of the ones taught by US 5,685,771, in order to take advantage of the large optical anisotropy and light stability, of the compound, as taught by Sekine.

12. Applicant argues that Sekine does not even relate to the use of a liquid crystal compound in a polarization sensitive scattering element (PSSE) as disclosed by Larson, [and is therefore not analogous art].

Applicant is respectfully apprised that Larson, as the primary reference, discloses the use of a polymer dispersed liquid crystal (PDLC) film as part of the polarization sensitive scattering element (PSSE, column 6, lines 22-30), for use in a liquid crystal display (column 2, lines 64-67). Sekine, as the secondary reference, discloses a polymer dispersed liquid crystal (PDLC) film with a liquid crystal compound that has

large optical anisotropy and light stability, for use as a liquid crystal element in a liquid crystal display. Hence both Larson and Sekine are directed to the field of liquid crystal displays, and are therefore analogous art.

13. Applicant's arguments against Shen are directed against the validity of the combination of Larson in view of Sekine, and have been addressed above.

Any inquiry concerning this communication should be directed to Sow-Fun Hon whose telephone number (571)272-1492. The examiner can normally be reached Monday to Friday from 10:00 AM to 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon, can be reached on (571)272-1498. The fax phone number for the organization where this application or proceeding is assigned is (571)273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. Hon

Sow-Fun Hon

2/17/06

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